Paleontology at Petrified Forest National Park

Landscape in the Late Triassic Epoch. (Doug Henderson)

Trees to Stone

Petrified Forest is a popular stop for visitors traveling through northern Arizona. Each year half a million visitors are drawn by the allure of a forest turned to stone. Huge petrified logs are strewn across the terrain. How did these majestic trees, that once grew up to 200 feet tall and 10 feet in diameter, become so perfectly preserved? The phenomenon is still not completely understood, but scientists have reached a basic understanding of this astounding scientific process.

In the distant past, after trees fell over from natural causes such as old age, flooding, or lightning, they were carried downriver, settling on sand bars and creating log jams. The trees were buried under deposits of sediment, slowing down the process of decay due to the scarcity of oxygen. Silica-rich ash, spewed from distant volcanoes, was mixed into the sediment. The silica dissolved into groundwater and the solution seeped into the cells of the buried trees. Crystals formed within spaces in the logs, including hollows, cracks and the interior of the cells. The wood tissue degraded, partially or fully replaced by minerals, leaving behind beautiful fossils.

Petrified Forest National Park boasts some of the most colorful and abundant petrified wood in the world. As you walk the trails of Giant Logs, Crystal Forest, or Long Logs, take time to appreciate these amazing relics of the past. Due to the fossilization of these trees and other plants and animals we are able to travel back through time more than 200 million years and understand what that ancient environment must have been like.

From Discovery to Display

Petrified Forest National Park holds a variety of different interests for visitors. Fossils and the reconstruction of those fossils are one of the main interests of the park. The scientists who search for and discover these links to the past are known as paleontologists. Many hours of hard work are put into a single fossil before it is ever seen in a display.

It all begins with the activity of prospecting, searching for a site with fossils that can be excavated. The search requires hiking through the badlands of the park for long periods of time, usually in the heat of summer, until a fossil is discovered. Then the slow, careful process of excavating the remains begins. Typically, a fossil is left in the rock material in which it is encased. Everything is wrapped up in strips of burlap that have been soaked in plaster. Once the plaster hardens the entire mass can be moved safely from the site to a preparation laboratory.

In the fossil preperation lab, workers begin removing the plaster jacket surrounding the fossil material. With special tools, such as miniature jackhammers that run on air, the bone is extracted from the surrounding rock. This is often the most time consuming part of the entire process.

Once the bone is completely removed and cleaned it may be placed inside of a special display case. The display case is then presented to the public for all to enjoy! Be sure to visit the Rainbow Forest Museum to see a selection of the fossils discovered in Petrified Forest National Park.

Paleontologist Bill Parker at a fossil excavation

Ancient Insects

The important role of insects and other small arthropods in the Late Triassic ecosystem is often overlooked because their actual fossilized remains are very rare. There is much indirect evidence of their existence and activities preserved in the plant fossils of the park. This evidence takes several forms and shows that a considerable variety of insects were present and interacting with the plants.

Most evidence of interaction is related to the use of plants for food. For example, bite marks are present at various places on some leaves. Evidently the leaves were still alive when they were attacked because a rim of callous tissue occurs along the edges of the incisions and shows that the leaves survived at least long enough for the wounds to heal. Many of the logs exposed in the park have marks on them indicating their use as food by insects. It appears that in most cases the grazing occurred after the trees died because the wounds do not show signs of healing. The most common evidence of this type consists of channels and channel fillings on the exterior of the trunks, which were formed between the wood and bark. Some

Triassic beetle borings are trace fossils

logs contain small, simple borings of different sizes, orientation, and distribution. Beetles were probably responsible for all of these types of feeding traces.

In addition to utilizing plants for food, some of the arthropods used them for shelter and to assist in reproduction. Swellings on leaves of one species (called galls) were evidently used for shelter by mites. The evidence that plants played a role in the reproduction of insects is small elliptical scars on the stems of some of the herbaceous plants that occur in the Chinle. These scars probably were formed when dragonflies laid their eggs in the soft tissue of the stems.

Comparing fossil evidence from Petrified Forest's ancient past with modern ecosystems shows that the battle between insects and plants has changed little over millions of years.

Cynepteris lasiophora (fern)

Laccopteris smithii (fern)

Beyond the Trees

Although Petrified Forest National Park was originally established to protect the large deposits of petrified wood, the park also contains an amazing variety of other plant fossils. Research has shown that these fossils include leaves, cones, small stems, seeds, pollen, and spores, representing most groups of living plants except for the flowering plants. In spite of 150 years of study, the flora is still not completely known. New species are continually being discovered.

Plant fossils found in Petrified Forest National Park occur in the Chinle Formation, which is Late Triassic in age, more than 200 million years old. This part of Arizona was relatively close to the equator when the Chinle Formation was being deposited. The remains of plants that generally thrive in a warm, moist climate are some of the most common plant fossils in the park. Some species are closely related to certain plants that currently live in southeastern Asia where there is an abundance of rainfall. Such plants include several of the ferns with fairly large delicate leaves. The park's fossil horsetails have stems ranging up to about one foot in diameter, probably standing as tall as 20-30 feet. Another group of tropical plants commonly found in the park is the cycads and their extinct relatives the bennettitales that have large showy leaves and short thick stout stems. Practically the only coniferous fossils found in the park are the large petrified trunks.

Perhaps as many as one third of the species described from the park are not closely related to any group of living plants except in general terms. Still, the flora would not seem too alien if one could go back in time and visit the area of the park over 200 million years ago.